We claim:

1. A method for obtaining closed form expressions for subsurface temperature depth distribution along with its error bounds, the method comprising using a stochastic heat conduction equation incorporating random thermal conductivity to obtain a mean and variance in temperature fields for a set of boundary conditions: the equation consisting of

$$\frac{d}{dz}\left\{ (\overline{K} + K'(z))\frac{dT}{dz} \right\} = -A(z) \qquad (1)$$

where

T is the temperature ($^{\circ}C$) ,

A(z) is the radiogenic heat source ($\mu W/m^3$),

K(z) = $\overline{K}$ + K'(z) is the thermal conductivity ($W/m\ ^{\circ}C$)

which is expressed as a sum of a deterministic component and a random component

K'(z) is the random component with mean zero and a Gaussian colored noise correlation structure represented by

$$E(K'(z)) = 0 \qquad (2)$$

$$E(K'(z_1)K'(z_2)) = \sigma_K^2 e^{-\rho|z_1 - z_2|} \qquad (3)$$

where

σ_K^2 is the variance is thermal conductivity ($W/m\ ^{\circ}C)^2$

ρ is the correlation decay parameter m^{-1} (or $1/\rho$ is the correlation length scale) and

z_1 and z_2 are the depths (m)

2. A method as claimed in claim 1 wherein the boundary condition consists of condition of heat sources and is selected from the group consisting of Zero (A(z) = 0) , Constant (A(z) = A) and exponentially decreasing with depth ($A(z) = A_0 e^{-z/D}$).
3. A method as claimed in claim1 wherein the boundary condition comprises constant surface temperature and constant surface heat flow.
4. A method as claimed in claim1 wherein the boundary condition comprises constant surface temperature and constant basal heat flow.
5. A method as claimed in claim 1 wherein a parameter used is that of radiogenic heat generation.
6. A method as claimed in claim 1 wherein the method is carried out electronically using a computing means and wherein appropriate numerical values are given for controlling

thermal parameters directly in the boxes that appear on the screen, thereby instantaneously computing and plotting the mean and error bounds on the temperature depth distribution.

7. A method as claimed in claim 1 wherein the subsurface is selected from an oil field, a natural gas field, tectonically active area and a mineral resource area.